Patent Application

of

Timothy M. Bronson and Brian V. Fiala

for

Valley Truss Uplift Resistance Strap With Wedge and Method of Use

BACKGROUND - FIELD OF INVENTION

This invention relates to uplift resistance straps and tie-downs used in roof construction, specifically to an uplift resistance strap, and a method for its use in roof construction, for tie-down requirements of manufactured valley truss components supported by structural wood members or standard manufactured wood roof truss systems, the strap having a unitary construction, a substantially planar base member, and a web member extending upwardly at an acute angle from the base member so that a triangular wedge is formed between the base member and the web member.

BACKGROUND - DESCRIPTION OF PRIOR ART

During the past ten years, local communities have become increasingly strict in the enforcement of building codes to achieve quality construction. This particularly applies to roof construction in commercial and residential buildings, to give assurance that finished roofs will have the uplift resistance needed to withstand the damaging effects of strong winds. Current regulations governing construction can differ in neighboring communities. However, over the next few years it is expected for regional rules to be established, rather than having the standards vary from one county to the next. For instance, in Florida where most communities are subject to

the recurring threat of hurricane force winds, it would be reasonable for one standard building code to be established for the entire state, and a 120 mph wind with a 7-lb per square foot gravity resistance is likely to become the standard criteria. Also, when such widespread standards become effective, it is anticipated that local building inspectors will become more conservative in the enforcement of building connections and applications, and as a result, the cost of construction may increase. To prevent such a rise in cost, it would be desirable to find alternative ways of providing uplift resistance to roof systems that are more cost-effective than those currently used.

In most commercial and residential construction, pre-engineered wood trusses are specified on the architectural plans for roof systems, and then applied to a building structure. To achieve construction in a building that is up to code, multiple connections have to be made between adjacent construction materials in roof and floor systems, including the pre-engineered trusses and adjacent structural and framing members. These types of connections are accomplished by many devices, such as anchors, hangers, straps, ties, clips, plates, connectors, beam seats, post and column caps, holdowns, and the like, and take place from the foundation, all the way up to the roofing materials. The sizable number of connection devices required in even the simplest of structures, and the amount of labor needed for the installation of each such device, as well as consideration of the competitive nature of the building industry in general, causes construction companies to seek cost-saving measures in all phases of construction, including faster and easier ways in which to achieve the structural member connections mentioned above, that are required by code to secure floor and roof systems.

Use of the present invention provides cost savings for the connections needed between adjacent roof systems having manufactured wood trusses that run perpendicular to one another, and create a valley area where one overlaps the other. A commonly used method of connecting manufactured valley trusses to the standard manufactured wood roof trusses which support them in a valley, requires a preliminary step of cutting through the roof sheathing adjacent to each intersection of a valley truss and a standard roof truss, insertion of one elongated tie-down strap through each hole, followed by the nailing of each such tie-down strap from both above and below the roof sheathing. The labor-intensive steps of cutting a hole on-site and either the use of two people to connect a tie down strap from above and below the roof sheathing at the same time, or for the same person to perform the steps of above-roof and below-roof attachment in sequence, can be avoided by use of the present invention. Furthermore, the present invention provides a wedge that eliminates the need for beveling the bottom chords of manufactured valley trusses, on-site or during manufacture, to accommodate the inclined surface of the top chords of the underlying standard manufactured wood roof trusses and provide a solid connection therebetween, or in the alternative for on-site creation and installation of stand-alone wedges between the valley trusses and the underlying standard manufactured wood roof trusses.

Valley trusses are applied to current roof construction as an inexpensive way to fill in roof planes between adjacent roof systems that have trusses perpendicular to one another. The structural integrity of standard manufactured wood roof trusses is used as support for each overlying manufactured valley truss. To provide the uplift resistance against strong winds required by building codes, the bottom chord of each valley truss must be connected numerous times to the standard roof truss situated perpendicular therebelow. Engineering requirements for

uplift resistance are currently being satisfied by the standard practice of connecting an elongated tie-down strap at each intersection of a valley roof truss and the standard roof trusses bearing perpendicular therebelow. A hole is first cut on-site through the plywood attached to the top chord of the standard roof trusses, near to each intersection, then the elongated tie-down strap is inserted through the hole. Thereafter, the tie-down strap is secured to both trusses in the intersection, with the installer first working from one side of the roof plane, for example above the plywood where connection is first made to the bottom chord of the valley truss, and the installer then moving to a convenient location under the roof plane and below the plywood to nail each tie-down strap to the top chord of the corresponding standard roof truss. It becomes a labor-intensive and costly process, since tie-down straps must be applied at four-foot intervals using eight nails through each strap. Additional on-site labor is also needed when the valley trusses are not beveled and wedges are required that offer a horizontally extending bearing surface for the non-beveled bottom chords of valley trusses, so that during use the valley truss is solidly supported in a substantially horizontal orientation across its entire length. Labor to install such wedges between the intersection of the bottom chord of the valley truss and each top chord of the standard roof trusses perpendicular therebelow, would also be required. The present invention offers a pre-formed wedge made from durable material, such as metal or plastic, with connection for the wedge to valley or roof trusses being made through its adjacent base member and the web member upwardly extending therefrom, and in some embodiments with additional connection through the wedge itself. Further, depending upon its construction, and the material from which it is made, the pre-formed wedge can be solid or hollow. As a result of its use, the present invention eliminates both the step of creating wedges on-site, typically made from wood, as well

as the step of installing them without splitting, cracking, and/or other damage that can occur when nails are applied to prior art wedges during installation. As a result, the present invention is able to offer labor and cost savings to a builder in meeting the roof system uplift resistance requirements established by code, by providing connections that are faster and easier to make between standard manufactured wood roof trusses and the manufactured valley trusses that bear perpendicular above them, by eliminating the need to penetrate plywood sheathing material connected adjacent to the valley trusses for attachment of tie-down straps to the chord of the standard roof trusses below, as well as by providing a pre-formed wedge that eliminates the labor intensive steps of beveling bottom chords, and/or creating and installing stand-alone wooden wedges. No device similar to the present invention is known, nor is there another uplift resistance tie-down strap known that provides all of the advantages of the present invention.

SUMMARY OF INVENTION - OBJECTS AND ADVANTAGES

It is the primary object of this invention to provide an uplift resistance strap for faster, labor-reducing, and more cost-effective connection of manufactured valley trusses to underlying standard manufactured wood roof trusses bearing perpendicular thereto. It is also an object of this invention to provide an uplift resistance strap for roof construction and a method for its use that meets construction code requirements. A further object of this invention is to provide an uplift resistance strap for roof construction that does not require the making of a hole in the roof sheathing adjacent to the valley truss for its attachment.

As described herein, properly manufactured and used, the present invention would provide an uplift resistance strap having a pre-formed wedge for support of the bottom chord of a valley truss in a leveled, horizontally extending orientation to eliminate time-consuming on-site preparation that is otherwise needed to achieve a strong and solid connection between it and each

underlying standard roof truss supporting it. Also, the present invention provides additional labor cost reduction, since the present invention is positioned between the bottom surface of the bottom chord of a valley truss and the top surface of the top chord of the underlying standard roof truss, and as a result labor intensive steps of making holes in the roof sheathing material adjacent to the valley truss, used for support of an overlying roof structure, as well as the step of connecting each of the elongated tie-down straps both above and below such sheathing, are no longer required to meet uplift resistance code requirements. The present invention can easily be manufactured with different angles between its upwardly extending web member and its attached substantially planar base member, allowing it to be readily available for use without on-site accommodation for construction of roofs with different pitch.

The description herein provides preferred embodiments of the present invention but should not be construed as limiting the scope of the uplift resistance strap invention. For example, variations in the width and thickness of the strap material used; the type of material from which the straps are made; the size and type of fastener used to connect the strap to the manufactured valley trusses and the underlying standard manufactured wood roof trusses; the number and positioning of the fastener holes; the length of the upwardly extending web member; and the dimension of the acute angle formed between the upwardly extending web member and the planar base member; other than those shown and described herein, may be incorporated into the present invention. Thus, the scope of the present invention should be determined by the appended claims and their legal equivalents, rather than being limited to the examples given.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is perspective view of a first embodiment of the present invention having a planar base member, a web member upwardly extending from the base member at an acute angle, a wedge positioned within the acute angle, and a plurality of fastener holes through the web member and the opposing ends of the base member.

Fig. 2 is a front view of two first embodiment uplift resistance straps attached between a manufactured valley truss and two standard manufactured wood roof trusses supporting it.

Fig. 3 is a perspective view of the first embodiment connected between a vertically extending piece of construction material with a non-beveled bottom end, and the top chord of a standard manufactured wood roof truss.

Fig. 4 is a perspective view of the first embodiment connected between a non-beveled horizontally extending bottom chord of a manufactured valley truss and the top chord of a standard manufactured wood roof truss.

Fig. 5 is a top view of a second embodiment of the present invention in a substantially flat, unfolded condition.

Fig. 6 is a top view of the second embodiment in a partially folded condition.

Fig. 7 is also a top view of the second embodiment in a partially folded condition.

Fig. 8 is also a top view of the second embodiment in a partially folded condition.

Fig. 9 is a top view of the second embodiment in a nearly complete folded condition.

Fig. 10 is a top view of a third embodiment of the present invention in a substantially flat, unfolded condition.

Fig. 11 is a top view of the third embodiment in a partially folded condition.

Fig. 12 is a top view of the third embodiment in a nearly complete folded condition.

Fig. 13 is a perspective view of a fourth embodiment of the present invention in a partially folded condition.

Fig. 14 is a perspective view of the fourth embodiment in a nearly complete folded condition.

Fig. 15 is a perspective view of the fourth embodiment in its completely folded condition ready for use.

Fig. 16 is a top view of the fourth embodiment in a substantially flat, unfolded condition.

Fig. 17 is a perspective view of the fourth embodiment connected between a vertically extending piece of construction material with a non-beveled bottom end, and the top chord of a standard

manufactured wood roof truss.

Fig. 18 is a perspective view of the forth embodiment connected between a non-beveled horizontally extending bottom chord of a manufactured valley truss and the top chord of a standard manufactured wood roof truss.

Fig. 19 is a side view of the fourth embodiment having a nail inserted through the lower portion of the web member, the wedge, and the base member.

Fig. 20 is a perspective view of a several present invention uplift resistance straps each connected between the horizontally extending bottom chord of a manufactured valley truss and the top chord of a standard manufactured wood roof truss.

Fig. 21 is a perspective view of two perpendicularly oriented roof structures having a valley therebetween in which the present invention could be used to provide uplift resistance.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention provides uplift resistance to roof construction where valleys occur, two examples of which are shown in Figs. 20 and 21. Fig. 20 shows the construction of what could be a small porch roof connected to a larger roof structure behind it, with the standard roof trusses 18 below bearing perpendicular to the overlaying porch trusses 16. This overlap of roof and porch trusses, to fill in the roof plane, creates a valley. In contrast, Fig. 21 shows two full roof structures connected to one another in a T-shaped configuration. The fill area where the roof structures overlap and a set of roof trusses 18 below bear perpendicular to a second overlaying set of roof trusses 16, also comprises a valley. In addition to uplift resistance, the present invention would also provide a built-in wedge configured to level the overlaying valley trusses, without a need for beveling the bottom chord of each valley truss or a need for the time-consuming on-site manufacture and installation of stand-alone wedges that allow a solid connection between supported valley trusses 16 and the sloping top chords of the standard roof trusses 18 beneath them. Further, the present would replace an elongated prior art tie-down strap

that must be attached to adjoining trusses through a hole made on-site in the roof sheathing adjacent to the truss intersection. Thus, connection of the elongated prior art tie-down straps is accomplished in a separate step following the step of attaching the valley truss to underlying standard roof trusses. Further, installation of the elongated tie-down strap typically requires two people, with one person positioned above the roof plane to connect the upper portion of the elongated tie-down strap to the valley truss and another person below the roof plane to connect the lower portion of the elongated tie-down strap to the standard roof truss, or the same person to sequentially perform the upper and lower tie-down strap connections. In contrast, installation of the present invention is faster as it is used directly in the connection of a valley truss to each of the standard roof trusses supporting it, so that connection, leveling, and uplift resistance requirements are all satisfied in a single installation step. The present invention, already having a pre-formed wedge incorporated therein, also eliminates a need for additional steps involving the creation and connection of a stand-alone wedge or subsequent tie-down connection at each intersection of a manufactured valley truss to a standard manufactured wood roof truss. It is contemplated for the present invention to be made of rigid materials and have a unitary construction. However, the present invention can be made from plastic, nylon and other materials formed through molded construction, or in the alternative made from a stamped piece of rigid material, preferably galvanized steel, that is pre-formed into the approximate configuration shown in Fig. 1. The wedge of the present invention, pre-formed at a designated angle appropriate to the slope of the top chord in each of the underlying standard roof trusses with which it is contemplated for use, provides leveling for an overlaying valley truss without the costly, labor-intensive process of beveling the bottom surface of each valley truss, either during manufacture or on-site, or the creation and connection of stand-alone wedges that are connected between the bottom chord of a valley truss and the top chord of each standard roof truss supporting it. The wedge can be solid or hollow, depending upon the materials used for its construction. Further, since holes are pre-formed through the upwardly extending web member

and the base member of the present invention, an installer is not confronted with the additional time delays resulting from replacement of wooden wedges that split or crack during fastener attachment.

Fig. 1 shows a first embodiment 2 of the present invention having a planar base member with a first end 4 and a second end 6, and a web member 10 upwardly extending from second end 6 to form an acute angle 12 relative to first end 4. Although web member 10 appears to have approximately the same length dimension as first end 4 and second end 6, web member 10 could be shorter or longer than first end 4 and second end 6, with the length of web member 10 being determined by the governing uplift resistance code requirement. An embodiment where second end 6 is shorter that web member 10 and first end 4 has been omitted, is shown in Fig. 15. Fig. 1 also shows a wedge 8 positioned within acute angle 12, and connected between first end 4 and web member 10. The height of the taller end of wedge 8 would vary according to different pitch applications. Also, although not limited thereto, the upper surface of wedge 8, which provides the seat area for an overlaying valley truss 16, would preferably have a minimum surface area of approximately one-and-one-half square inches. Fig. 1 further shows two fastener holes 14 in web member 10, two fastener holes 14 in second end 6, and one fastener hole 14 in first end 4. The number, size, spaced-apart distance, alignment, and configuration of fastener holes 14 are not critical, and at a minimum would be sufficient to meet nailing and uplift resistance requirements of the local or regional building code. Fig. 1 also shows the distal ends of first end 4, second end 6, and web member 10, each being substantially rectangular in configuration and having chamfered edges to help resist bending the could otherwise occur from uplift. In addition to the configuration of corners appearing to be cut off at an approximate 45° angle, it is considered to be within the scope of the present invention for the distal ends of first end 4, second end 6, and web member 10, to also have the rounded configuration shown in Figs. 5-9, or other linear, arcuate, or curvilinear configuration. It is contemplated that first embodiment 2 would be made from molded construction, using metal, plastic, nylon, or any other material permitted by code. One

preferred plastic material is polycarbamate. Also, although not limited thereto and only provided as an example, it is contemplated that the length dimension of first embodiment 2, from the distal end of first end 4 to the distal end of second end 6, would be a minimum of approximately four inches and a maximum of approximately twelve inches. The first embodiment shown in Fig. 1 could represent either a molded or folded uplift resistance strap. The taller end of wedge 8, which is shown in Fig. 1 in a position facing second end 6, has an open configuration expected in folded embodiments formed from the unfolded stamped configurations of second embodiment 24 and third embodiment 26, shown in Figs. 5 and 10, respectively, the vertical support for wedge 8 being derived from its rigid side structures. In contrast, the embodiments of the present invention made through molded construction could either have a solid wedge 8, or a hollow wedge 8 similar to that shown in Fig. 1.

Fig. 2 shows first embodiment 2 attached between the bottom chord of a valley truss 16 and the top chord of a standard roof truss 18 supporting it. Although two first embodiment 2 attachments are shown, the number of first embodiments 2 connected between valley truss 16 and standard roof trusses 18 would be determined by code. The upstanding web member 10 in each first embodiment 2 is connected to the downwardly facing side of a supported valley truss 16 through fasteners (not shown) inserted through fastener holes 14, while the second end 6 of each first embodiment 2 is connected to the top cord of the standard roof truss 18 supporting the same valley truss 16, also via a fastener (not shown) inserted through each fastener hole 14 present in the planar base member of first embodiment 2, which includes second end 6 and first end 4 (not visible in Fig. 2). When the present invention is relied upon to provide a wedge 8 for non-beveled trusses 16, one first embodiment 2 would become connected at every intersection of valley truss 16 to standard roof trusses 18. As shown in Fig. 2 and mentioned above, the uplift resistance straps of first embodiment 2 are only secured on the side of valley truss 16 that is facing the downward sloping ends of the standard roof trusses 18 supporting it.

Fig. 3 shows first embodiment 2 connected between a vertically extending piece of

construction material 20 with a non-beveled bottom end 22, and the top chord of a standard roof truss 18. Fig. 3 shows second end 6 attached to the portion of standard roof truss 18 in a position downwardly extending below construction material 20, and web member 10 attached to the side of construction material 20 that faces the downwardly extending end of standard roof truss 18 supporting it. Fig. 3 further shows the non-beveled bottom end 22 of construction material 20 supported in a substantially level position upon wedge 8, and first end 4 positioned against the top chord of the portion of standard roof truss 18 upwardly extending beyond construction material 20.

Fig. 4 shows first embodiment 2 connected between a horizontally extending bottom chord of a manufactured valley truss 16 and the top chord of a standard roof truss 18. As shown in Fig. 4, first embodiment 2 is only secured to valley truss 16 via web member 10, and only on the vertical side of valley truss 16 that is facing the downwardly extending ends of standard roof trusses 18. Connection between first embodiment 2 and the top chord of a standard roof truss 18 is accomplished via the planar base member of first embodiment 2, which comprises second end 6 and first end 4. This is in contrast to the fourth embodiment 32 shown in Fig. 19, wherein the bottommost fastener hole 14b in web member 10 is used in part to attach web member 10 to the top chord of the supporting standard roof truss 18. In Fig. 4, second end 6 is placed in a position adjacent to valley truss 16 and downwardly extending from valley truss 16 with fasteners inserted through fasteners holes 14 and secured between first embodiment 2 and standard roof truss 18, while first end 4 is placed in a position adjacent to valley truss 16 and upwardly extending therefrom, also being secured by fasteners inserted through fasteners holes 14. As shown in Fig. 4, wedge 8 is positioned under the bottom chord of valley truss 16. The degree of incline provided by wedge 8 can be varied during manufacture, to accommodate a difference in roof pitch. Also, although not critical, Fig. 4 shows first end 4 and second end 6 extending the full width of standard roof truss 18. The width and thickness dimensions of first end 4, second end 6, and web member 10 can vary, so as to allow a balance between the need for cost-efficient

construction and compliance with the governing code requirements. The relative dimensions of first end 4, second end 6, and web member 10 can also vary, as can the number and positioning of fastener hole 14 therethrough. Also, although steel and selected plastics, such as polycarbamate, are preferred for the manufacture of first embodiment 2, other materials can be used as long as they meet the necessary strength requirements to satisfy the governing uplift resistance code.

Figs. 5-9 show a second embodiment 24 of the present invention in an unfolded condition, and various phases of folding. In Figs. 5-9 the distal perimeter of first ends 4A and 4B, second ends 6A and 6B, as well as web member 10 are shown to have a rounded configuration. Although a blunt perimeter is favored for safety considerations to avoid injury, other perimeter configurations are also considered to be within the scope of the present invention, such as a rectangular configuration and the rectangle with chamfered ends shown in Figs. 10-12 for web 10, first side 4 and second side 6, wherein the corners of are all cut off at an approximate 45° angle. Fig. 5 shows second embodiment 24 in a substantially flat, unfolded condition. The arrows above web member 10 show that as the second embodiment 24 takes its final form, web member 10 would be moved rearwardly and away from second ends 6A and 6B. The arrows adjacent to second ends 6A and 6B, show that as the second embodiment 24 takes its final form, second ends 6A and 6B would each be moved forwardly and toward one another. Figs. 6, 7, and 8 show second embodiment 24 in a partially folded condition, with each successively higher numbered illustration showing second embodiment 24 progressively closer to its usable configuration, while Fig. 9 shows second embodiment 24 in a nearly complete folded condition. Fig. 6 shows second ends 6A and 6B closer together than in Fig. 5, with web member 10 more rearwardly positioned than in Fig. 5. Fig. 7 shows second end 6B being inwardly folded and rotated approximately 180° from its original pre-folded position, with second end 6B being poised for a similar 180° inwardly folded rotation. Although second end 6B is shown undergoing the 180° rotation first, the order of such rotation is not critical. Fig. 8 shows both second ends 6A

and 6B after undergoing a near 180° rotation, but not yet aligned with one another as they would be when second embodiment 24 has reached its final configuration. Fig. 10 shows second end 6B and first end 4B aligned with web member 10, with second end 6A and first end 4A needing approximately 90° more rotation for second embodiment 24 to reach its usable configuration, similar to that shown in Fig. 1. When folding is complete, wedge 8 in second embodiment 24 would have the same hollow configuration shown in Fig. 1. It is contemplated for second embodiment 24 to be made from rigid material, such as steel, plastic, or nylon, and have a substantially uniform thickness.

Figs. 10, 11, and 12 respectively show a third embodiment 26 of the present invention in a substantially flat unfolded condition, an intermediate folded condition, and a nearly complete folded condition. It is contemplated for third embodiment 26 to be made from rigid material, such as steel, nylon, or plastic, and have a substantially uniform thickness. Figs. 10-12 further show the planar base member having first end 4 and second end 6, and web member 10 all of similar length and width dimension, each as being substantially rectangular with chamfered distal ends, wherein the corners are all cut off at an approximate 45° angle. Fig. 10 shows third embodiment 26 in a substantially flattened condition, prior to folding. In Fig. 11, the arrows above web member 10 show that as the third embodiment 26 takes its final form, web member 10 would be moved rearwardly and away from wedge 8. The arrows adjacent to second end 6 and first end 4, show that as the third embodiment 26 takes its final form, second end 6 and first end 4 would each be moved forwardly and toward one another. Fig. 12 shows that first end 4 and second end 6 also undergo an approximate 180° rotation relative to their original pre-folded conditions, prior to the third embodiment 26 reaching its usable configuration. Either second end 6 or first end 4 can be folded in advance of the other, or both can be folded at once since there is no overlap of one member relative to the other similar to that occurring in the folding of second embodiment 24. Fig. 12 shows second end 6 and first end 4 almost aligned with one another as they would be when third embodiment 26 has reached its final configuration, similar to that

shown in Fig. 1, with third embodiment 26 having a hollow wedge 8. The adjoining surfaces of first end 4 and second end 6, which extend diagonally and form the bottom surface of wedge 8, can be bonded or welded to one another during manufacture, if needed to satisfy the governing code requirements.

Figs. 13-19 show a fourth embodiment 32 of the present invention in an unfolded condition, and various phases of folding, as well as in positions of use. Figs 13 and 14 show fourth embodiment 32 in partially folded conditions, while Fig. 16 shows fourth embodiment 32 in a substantially flat, unfolded condition and Fig. 15 shows fourth embodiment 32 in its completely folded condition ready for use. Fig. 15 shows the present invention having an upstanding web member 10, a hollow wedge 8 having an upper surface 28 extending forwardly from web member 10, a rearwardly extending second end 6, and several fastener holes 14. Second end 6 is significantly shorter than web member 10, and in fourth embodiment 32 no first end 4 is present. Another difference in fourth embodiment 32 is that wedge 8 has a vertical back wall containing fastener hole 14b1, instead of the laterally positioned walls shown in Fig. 1. A further difference between fourth embodiment 32 and the other illustrated embodiments of the present invention is that fourth embodiment 32 contains fastener holes 14b, 14c, 14b1, and 14c1, which collectively allow a fastener, such as fastener 34 in Fig. 19, to be secured through wedge 8. Although not limited thereto, Fig. 15 shows three fastener holes 14 through web member 10, with the upper holes being offset from one another as well as from the laterally centered bottom fastener holes 14. While the angle 12 between upper wedge surface 28 and web member 10 is shown in Fig. 15 to be approximately 90°, the intersection between the bottom surface of wedge 8 and web member 10 typically represents an acute angle more pronounced than illustrated. Fig. 16 shows fourth embodiment 32 in its flattened, unfolded condition. Moving from left to right in the illustration of unfolded fourth embodiment 32 in Fig. 16, one first encounters web member 10 with three fastener holes, the bottommost of which is designated by the number 14b. To the right of web member 10, one next encounters rearwardly extending second end 6, with one

centrally positioned fastener hole 14a. The bottom surface 30 of fourth embodiment 32 is situated to the right of rearwardly extending second end 6 and contains two fastener holes 14a1 and 14c. The upper surface of wedge 8 extends to the right of bottom surface 30 and has no fasteners holes 14. The remaining two sections of fourth embodiment 32 having centered fastener holes 14b1 and 14c1 are unnumbered and are reinforcement members for wedge 8, the one which contains fastener hole 14b1 forming a vertically extending back wall of wedge 8 during use. Thus, when fully formed, the structure of wedge 8 in the fourth embodiment would comprise open sides, a double layer of vertical support at its taller end, a partially doubled bottom surface 30, and aligned fastener holes 14b, 14b1, 14c, and 14c1 that would allow a fastener, such as fastener 34 in Fig. 19 to pass through both layers at the taller end of wedge 8, exit through both layers forming the bottom surface 30 of wedge 8, and enter the top chord of the standard roof truss 18 upon which the fourth embodiment 32 is supported during use. To fold fourth embodiment 32 into its usable configuration, the lower end of web member 10 is brought into contact with bottom surface 30 so that fastener holes 14a and 14a1 become aligned to form second end 6. As this occurs, rearwardly extending second end 6 becomes superimposed upon a portion of bottom surface 30. In a separate step, the opposing end on fourth embodiment 32 is folded to form wedge 8, with fastener hole 14b1 becoming aligned with fastener hole 14b in the lower end of web member 10, and fastener hole 14c1 becoming aligned with fastener hole 14c in bottom surface 30. Arrows in Figs. 13 and 14 show the directions of folding. Thus, it is contemplated for four fasteners, such as fastener 34 in Fig. 19 that is configured as a nail, to be used for securing fourth embodiment 32 in place during use. A first fastener 34 would extend through two fastener holes, 14a and 14a1 to connect second end 6 to the downwardly extending portion of the top chord of a standard roof truss 18. A second fastener 34 would extend through two fastener holes, 14b and 14b1, further extend through wedge 8, and then finally through two additional fastener holes, 14c1 and 14c to connect web member 10 and wedge 8 to the top chord of the same standard roof truss 18. The final two nails 34 would each extend through a different

one of the upper fastener holes 14 in web member 10 to connect web member 10 to the vertically extending sid eof valley truss 16 facing second end 6. Fourth embodiment 32 has the simplest construction, and would produce the least material waste during manufacture. It is contemplated for wedge 8 to be manufactured with varying pitch, depending upon the application, and for fourth embodiment 32 to be made from rigid material, such as steel, plastic, nylon, and have a substantially uniform thickness. As an alternative to folded construction, a molded embodiment similar to that shown in Fig. 15 is also considered to be within the scope of the present invention, and which would preferably have a solid wedge 8, as well as a fastener hole 14 through wedge 8 in a similar position to that shown for fastener 34 in Fig. 19. Although not limited thereto, such a molded embodiment could be made from plastic material, such as polycarbamate. Fig. 17 shows fourth embodiment 32 connected between a vertically extending piece of construction material 20 with a non-beveled bottom end 22, and the top chord of a standard manufactured wood roof truss 18, while Fig. 18 shows forth embodiment 32 connected between a non-beveled horizontally extending bottom chord of a manufactured valley truss 16 and the top chord of a standard manufactured wood roof truss 18. Although the upper surface 28 of wedge 8 is not marked in Fig. 17 or Fig. 18 for clarity of illustration, both Figs 17 and 18 show upper wedge surface 28 positioned entirely under the superimposed construction material, vertically extending piece of construction material 20 or manufactured valley truss 16, respectively.

Fig. 20 shows several present invention uplift resistance straps, such as first embodiments 2, each connected between the horizontally extending bottom chord of a manufactured valley truss 16 and the top chord of a standard roof truss 18. Fig. 21 is a perspective view of two perpendicularly oriented roof structures having a valley therebetween where the present invention could be used for uplift resistance. As shown in Fig. 20, the web members 10 of first embodiments 2 are only secured on the vertically extending side of valley trusses 16 facing the downwardly extending ends of standard roof trusses 18. It is contemplated that the web members 10 of the second embodiments 24, the third embodiments 26, and the fourth embodiments 32

would also be connected to the sides of valley trusses 16 the downwardly extending ends of standard roof trusses 18, with the bottommost fastener hole 14b of fourth embodiments 32 being used with a fastener 34 that extends into the top chord of a supporting standard roof truss 18 and thereby connects web member 10 and wedge 8 to the supporting standard roof truss 18.